Question Number	Scheme	Notes	Marks
Note: accept **i, j, k** notation or column vector notation throughout but condone column vectors written as coordinates			
5(a) (i) & (ii)	$\overrightarrow{OP}\times\overrightarrow{OQ}=\begin{pmatrix}2\\5\\0\end{pmatrix}\times\begin{pmatrix}-2\\6\\3\end{pmatrix}=\begin{pmatrix}15\\-6\\22\end{pmatrix}$	Correct vector. Award when first seen	**B1**
	$\begin{pmatrix}1\\2\\-1\end{pmatrix}\cdot\begin{pmatrix}15\\-6\\22\end{pmatrix}=\ldots\quad\{15-12-22=-19\}$	Correct method to find a value for the scalar product with their $\overrightarrow{OP}\times\overrightarrow{OQ}$. If just a value is given it must be correct, and could also be implied by the correct final answer	**M1**
	$\frac{1}{6}\left\lvert\begin{pmatrix}1\\2\\-1\end{pmatrix}\cdot\begin{pmatrix}15\\-6\\22\end{pmatrix}\right\rvert=\frac{19}{6}$	$\frac{19}{6}$ or any exact equivalent	**A1**
			(3)
(b)	$\overrightarrow{PQ}=\begin{pmatrix}-2\\6\\3\end{pmatrix}-\begin{pmatrix}2\\5\\0\end{pmatrix}=\ldots\begin{pmatrix}-4\\1\\3\end{pmatrix}$, $\overrightarrow{PR}=\begin{pmatrix}1\\2\\-1\end{pmatrix}-\begin{pmatrix}2\\5\\0\end{pmatrix}=\ldots\begin{pmatrix}-1\\-3\\-1\end{pmatrix}$, $\overrightarrow{QR}=\begin{pmatrix}1\\2\\-1\end{pmatrix}-\begin{pmatrix}-2\\6\\3\end{pmatrix}=\ldots\begin{pmatrix}3\\-4\\-4\end{pmatrix}$ Attempts two of $\pm\left(\overrightarrow{PR},\overrightarrow{QP},\overrightarrow{PQ}\right)$		**M1**
	$\overrightarrow{PQ}\times\overrightarrow{PR}=\begin{pmatrix}-4\\1\\3\end{pmatrix}\times\begin{pmatrix}-1\\-3\\-1\end{pmatrix}=\begin{pmatrix}8\\-7\\13\end{pmatrix}$, $\overrightarrow{PQ}\times\overrightarrow{QR}=\begin{pmatrix}-4\\1\\3\end{pmatrix}\times\begin{pmatrix}3\\-4\\-4\end{pmatrix}=\begin{pmatrix}8\\-7\\13\end{pmatrix}$, $\overrightarrow{PR}\times\overrightarrow{QR}=\begin{pmatrix}-1\\-3\\-1\end{pmatrix}\times\begin{pmatrix}3\\-4\\-4\end{pmatrix}=\begin{pmatrix}8\\-7\\13\end{pmatrix}$ Attempts a relevant vector product. This mark can be scored for sight of the correct 3 x 3 determinant with correct elements but allow one slip. If no working shown, then obtaining two correct components is sufficient to score this mark **Dependent on the first M mark**		**dM1**
	$\begin{pmatrix}8\\-7\\13\end{pmatrix}\begin{pmatrix}2\\5\\0\end{pmatrix}=\ldots\{16-35+0=-19\}$, $\begin{pmatrix}8\\-7\\13\end{pmatrix}\begin{pmatrix}-2\\6\\3\end{pmatrix}=\ldots\{-16-42+39=-19\}$ $\begin{pmatrix}8\\-7\\13\end{pmatrix}\begin{pmatrix}1\\2\\-1\end{pmatrix}=\ldots\{8-14-13=-19\}$ Calculates **a**.**n** with their normal. Requires 1st method mark only but normal cannot be $\overrightarrow{PQ}$, $\overrightarrow{PR}$, $\overrightarrow{QR}$,$\overrightarrow{OP}$, $\overrightarrow{OQ}$ or $\overrightarrow{OR}$. If just a value is given it must be correct **Dependent on the first M mark**		**dM1**
	$8x-7y+13z+19=0$ oe	Correct equation. Any multiple is acceptable.	**A1**
			(4)
(c)	$\frac{\lvert(12)(-4)+(-1)(-3)+(10)(2)\rvert}{\sqrt{12^2+(-1)^2+10^2}}$	Correct numerical expression for the distance but condone missing modulus sign. Allow the numerator in dot product form. Allow if one component of the normal vector is misread or one sign error etc, but the method is otherwise correct. Accept 1^2 for $(-1)^2$	**M1**
	$\left\{=\frac{\lvert-25\rvert}{7\sqrt{5}}\right\}=\frac{5\sqrt{5}}{7}$	$\frac{5\sqrt{5}}{7}$ only	**A1**
			(2)

ALT	$\overrightarrow{QS} \bullet \frac{\mathbf{n}}{\lvert\mathbf{n}\rvert} = \frac{\lvert(12)(-2)+(-1)(-9)+(10)(-1)\rvert}{\sqrt{12^2+(-1)^2+10^2}}$ OR $\overrightarrow{RS} \bullet \frac{\mathbf{n}}{\lvert\mathbf{n}\rvert} = \frac{\lvert(12)(-5)+(-1)(-5)+(10)(3)\rvert}{\sqrt{12^2+(-1)^2+10^2}}$	Correct numerical expression for the distance using the projection of S to any of the other points on the plane, resolved in the direction of the normal vector, but condone missing modulus sign	**M1**
	$\left\{=\frac{\lvert-25\rvert}{7\sqrt{5}}\right\}=\frac{5\sqrt{5}}{7}$	$\frac{5\sqrt{5}}{7}$ only	**A1**
			Total 9